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# Funnel Cakes and Film Thickness

## Sweet Stuff about Asphalt Pavement

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A *durable pavement* will be one with heavy asphalt film thickness accompanied by an appropriate aggregate skeleton. The film thickness is kind of like the mortar, which holds the stone skeleton together and the skeleton itself is the basic Hot Mix Asphalt building foundation. The awesome result of these combined materials is an incredibly durable self-healing product we call *flexible pavement*.

The purpose of a heavy film thickness is to keep the pavement alive through the tortures of temperature extremes and sometimes an inconsistent or unstable substructure; in most cases this means resistance to raveling, cracking and surface deterioration. The purpose of a strong aggregate skeleton is to withstand the incredible point pressures caused by an increasingly intense traffic load, which usually means resistance to rutting.

Careful evaluation of the volumetric properties is critical when designing Hot Mix Asphalt (HMA) so that the aggregate skeleton allows for this heavy film thickness without losing the necessary air void space, also needed to resist premature rutting. Voids in the Mineral Aggregate (VMA) is the measurement of space available in the aggregate skeleton. Minimum VMA criteria can help in assuring a desired level of film thickness.

Likewise, funnel cake is a delicious carnival snack but as the purchaser, we cannot be shy about saying "hey buddy, put an unbelievable amount of that powdered sugar on my cake, then flip it over and do it again." My wife used to walk away and shake her head, but I always said, "If they don't make it right, I'm not buying it." Most times they just hand

the sugar can out and say "do it yourself." Gotta love that!

The adoption of *superpave*, a design methodology birthed from the Strategic Highway Research Program (SHRP), was an awesome and necessary step in making major improvements to our road system. This is a scientific approach to better simulate the properties of actual roadway conditions in the laboratory. Understandably, the mixture design portion has gone through many changes and will continue to be improved upon. It has drastically improved overall mixture designs to resist rutting and enhance performance, through the adoption of not only the lab blending and mixture evaluation procedures but a complete overhaul of the liquid asphalt grading system to allow for climatic and other stress conditions.

One concern in the adoption process is the required minimum VMA criteria may not have been effectively addressed, which inadvertently allowed for reduced film thickness in some mixtures. This is understandable because the research was highly focused on Heavy Traffic Roads and even though the system was built with design compensation for things like varying traffic levels, the research into current guideline minimums on criteria like VMA could not take into account already established minimums in all areas of the US, mostly because of the crossover in aggregate sizes under the new system. Consequently, there was the potential for some mixes to have a reduced film thickness.

In addition, it is important to know that the VMA itself may not be a numeric reflection of Asphalt Film Thickness with all types of

aggregate. Because of this, some organizations have adopted minimum asphalt contents in addition to minimum VMA criteria.

Kind of like when I tell the guy, "flip over that funnel cake and do it again." It's much easier to get what you want if you can be very specific when you buy it.

Stone Matrix Asphalt (SMA), a European developed open graded mix which maintains a very high film thickness, is one such example of the enhanced performance which can be expected by maintaining heavy film thickness.

If the mixture is not high enough in film thickness, you will probably see the need for an interim surface treatment between regularly scheduled overlays in the life cycle of a pavement. My personal best definition of such a seal - or micro treatment - used on a major roadway is "I had an unexpected problem." In other words, there is a reason why the surface does not stay serviceable until the next scheduled overlay. If you compare the cost of a substantial increase in asphalt content in the initial Mix Design to the cost of an interim treatment, it is few pennies to the dollar.

As a team, our DOT's and industry can drastically improve film thickness and thereby durability while proposing insignificant additional costs to the Department by improving our criteria through a continuing partner effort. Adding asphalt film thickness in the HMA for all road levels will drastically minimize the need for many seal treatments and even crack sealing, an additional cost to the customer that will save them a fortune. Now that's what I call sweet! ■